WHAT IS CLAIMED IS:

1. A method of determining a reflectance spectrum, comprising:

obtaining a normalized value from a plurality of illuminant sensor outputs, each illuminant sensor output indicating a reflectance value obtained from a target;

obtaining reference data from a reference database that correlates reference spectra with a corresponding plurality of normalized illuminant sensor outputs for reference colors, the reference data including data in a neighborhood of each reflectance value; and

determining a spectrum $\hat{S}$ based on the illuminant sensor outputs and the reference data, wherein the determining step places greater importance on the data in the neighborhood of each reflectance value.

2. The method according to claim 1, wherein the determining step is performed based on linear operators.

3. The method of claim 2, wherein the linear operators include a conversion matrix A^*, and the determining step multiplies the conversion matrix by an augmented vector V of the normalized value.

4. The method of claim 3, wherein the conversion matrix is represented by

$$A^* = QP^{-1}$$

where

$$Q = \sum_{i=1}^{N} w(i) S_i Z_i^T \quad \text{and}$$

$$P = \sum_{i=1}^{N} w(i) Z_i Z_i^T$$

where $w(i)$ represents a weighting function that places greater importance on the data in the neighborhood of each reflectance value, N is a number of spectral samples in the reference database, S_i is an ith reference spectrum in the reference database, and Z_i is an i^{th} normalized illuminant sensor output in the reference database.

5. The method of claim 4, wherein $w(i) = \frac{1}{\|V - Z_i\|^p + \varepsilon}$,

where p is an integer number greater than or equal to 2 and ε is a small positive constant.

6. The method of claim 2, wherein the linear operators are represented by

$$C(i) = Z_i B(i)$$
$$b(i) = w(i) + C(i) Z_i^T$$
$$B(i+1) = B(i) - C(i)^T C(i) / b(i)$$
$$D(i+1) = D(i) + S_i^T Z_i / w(i)$$

where $w(i)$ represents a weighting function that places greater importance on the data in the neighborhood of each actual reflectance value, S_i is an i^{th} reference spectrum in the reference database, and Z_i is an i^{th} normalized illuminant sensor output in the reference database, the linear operators being recursively computed until $i = N$, where N is a number of spectral samples in the reference database.

7. The method of claim 6, wherein $w(i) = \|V - Z_i\|^p + \varepsilon$, where p is an integer number greater than or equal to 2 and ε is a small positive constant.

8. The method of claim 2, wherein the determining step avoids a recursive loop by including a matrix inversion.

9. The method of claim 2, wherein the determining step avoids a matrix inversion by including a recursive loop.

10. The method of claim 1, further comprising performing temperature compensation to the normalized value.

11. A spectral determination system, comprising:

a plurality of illuminants;

at least one photodetector that detects light originating from the plurality of illuminants and reflected by a target; and

a controller that:

normalizes a plurality of illuminant sensor outputs obtained from the at least one photodetector, each illuminant sensor output indicating a reflectance value obtained from a target;

obtains reference data from a reference database that correlates reference spectra with a corresponding plurality of normalized illuminant sensor outputs, the reference data including data in a neighborhood of each reflectance value; and

determines a spectrum $\hat{S}$ based on the illuminant sensor outputs and the reference data, wherein the determining step places greater importance on the data in the neighborhood of each reflectance value.

12. The spectral determination system according to claim 11, wherein the controller performs the determining step based on linear operators.

13. The spectral determination system of claim 12, wherein the linear operators include a conversion matrix A^*, and, in the determining step, the controller multiplies the conversion matrix by an augmented vector V of the normalized value.

14. The spectral determination system of claim 13, wherein the conversion matrix is represented by

$$A^* = QP^{-1}$$

where

$$Q = \sum_{i=1}^{N} w(i) S_i Z_i^T \quad \text{and}$$

$$P = \sum_{i=1}^{N} w(i) Z_i Z_i^T$$

where $w(i)$ represents a weighting function that places greater importance on the data in the neighborhood of each reflectance value, N is a number of spectral samples in the reference database, S_i is an i^th^ reference spectrum in the reference database, and Z_i is an i^th^ normalized illuminant sensor output in the reference database.

15. The spectral determination system of claim 14, wherein

$$w(i) = \frac{1}{\|V - Z_i\|^p + \varepsilon},$$

where p is an integer number greater than or equal to 2 and ε is a small positive constant.

16. The spectral determination system of claim 12, wherein the linear operators are represented by

$$\begin{aligned} C(i) &= Z_i B(i) \\ b(i) &= w(i) + C(i) Z_i^T \\ B(i+1) &= B(i) - C(i)^T C(i) / b(i) \\ D(i+1) &= D(i) + S_i^T Z_i / w(i) \end{aligned}$$

where $w(i)$ represents a weighting function that places greater importance on the data in the neighborhood of each actual reflectance value, S_i is an

i^{th} reference spectrum in the reference database, and Z_i is an i^{th} normalized illuminant sensor output in the reference database, the linear operators being recursively computed until $i = N$, where N is a number of spectral samples in the reference database.

17. The spectral determination system of claim 6, wherein $w(i) = \|V - Z_i\|^p + \varepsilon$, where p is an integer number greater than or equal to 2 and ε is a small positive constant.

18. The spectral determination system of claim 12, wherein, in the determining step, the controller avoids a recursive loop by including a matrix inversion.

19. The spectral determination system of claim 12, wherein, in the determining step, the controller avoids a matrix inversion by including a recursive loop.

20. The spectral determination system of claim 11, wherein the controller performs temperature compensation to the normalized value.

21. A coloring system incorporating the spectral determination system of claim 11.

22. The coloring system of claim 21, wherein the coloring system is one of a digital photocopier and a color printer.

23. The coloring system of claim 22, wherein the coloring system is a xerographic color printer.

24. The coloring system of claim 22, wherein the coloring system is an ink-jet printer.

25. A color detection system incorporating the spectral determination system of claim 11.

26. A storage medium on which is recorded a program for implementing the method of claim 1.